TECHNICAL REVIEW OF

SCOTT AIR FORCE BASE

REMEDIAL INVESTIGATION

(1/18/93)

(Additional 1/19/93 comments
follow these 1/18/93 comments)

EXECUTIVE SUMMARY

Page ES-1, First Complete Paragraph
What criteria was followed to determine the existence of 8 sites within the Scott AFB Operable Unit? Based on information page 3 of the 15 February, 1991, "Statement of Work" in Appendix D, several literature sources were utilized to determine the geological, hydrogeological and environmental settings for this RI. Among those sources was an IRP Phase I Report. We recommend that a copy of this report be included in the appendices.

Page ES-1, 2nd Complete Paragraph
Groundwater samples are described as being collected from a private well located approximately one-quarter mile south of the base. Soil boring and well installation logs for this private well should be included in the RI appendices, if possible. The second complete paragraph of page 4-269 generally describes the well, but includes little mention of the well's hydrogeologic setting or its construction. (See also Table 2-3 on page 2-19.) Is this privaate well set within the aquifer(s) which is presumed to be impacted by previous base activities? Do water supply wells exist closer to the base which are set in the impacted shallow aquifer? Have water samples been collected from these wells for analysis?

Apparently authorization to sample the above private well was given by the EPA. (See note 5, ERM Quality Assurance Audit on 11-29-88 in the field determined groundwater parameter section of Appendix E.) Please provide more information on the choice of this particular well.

Page ES-15, Second Paragraph
It is unclear what the sentence "Risks to human health associated with exposure to ground water and/or soils ... were outside of EPA's acceptable guidelines" means. Until table ES-6 is studied, it was uncertain if this statement

meant whether there was a high risk or low risk associated with these sites.

SECTION 1, INTRODUCTION

Page 1-3, Paragraph 2
Although various components of the waste stream for the landfill are listed, no concise estimate of waste quantities is found within the RI. Such an estimate would greatly facilitate the site's risk assessment. (Similar contaminant quantity estimates are missing from the historical assessment of all of the other sites, except for Site 5, where 13,000 gallons of LP-4 fuel are estimated to have spilled.)

Page 1-3, Paragraph 4
A confident assessment for the location of Site 2 is not avaiable. Land modifications are largely blamed for the difficulty in its location. The RI further indicated that the Site 2 boundaries are based on "historic aerial photographs". Increasing the areal exploration of the Soil Gas Survey illustrated on figure 4-17, page 4-108, would help to better determine the location and extent of petroleum-impacted soils due to past fire-training practices.

Page 1-6, Paragraph 2
An underground storage tank was "excavated for repairs" at the BX service station on the base. Additional information regarding this tank, and others at the station, should be included in this RI. For example, what are the UST dates of installation? Construction type? Cathodic protection? Leak detection?

SECTION 2, ENVIRONMENTAL SETTING

Page 2-4,Paragraph 3
Bedrock is described as existing at approximately 350 feet above msl in the southwest portion of the base; however, Figure 4-2 indicates that bedrock exists at approximately 339.6 feet above msl below monitoring well MW1-5.

Page 2-4, Paragraph 4
Although eolian deposits are described as being the uppermost of the surficial sediments, such deposits are not illustrated on Figure 2-6.

Pages 2-10 and 2-11, Unconsolidated Deposits and Soils
The general location and depth of various deposits and soils is discussed, but none of these materials are described texturally. Although described as "fine-grained and free-draining" on page 2-11, first paragraph, such descriptions are vague. More thorough descriptions would be helpful. For example, are those overlying loess deposits well-sorted with an average grain-size of 30-60 microns? Does "free-draining" mean these soils are well-drained or poorly-drained?

Page 2-14, Paragraph 1
A 630-foot well, drilled on the base during 1937, is identified as being "abandoned in place". Please provide records documenting that proper well-abandonment procedures were observed. Also locate the position of this water well on a site map.

Page 2-14, Ground Water Quality and Use
At least six (6) more wells are described as having been drilled on the base as water supply sources. Although their existence could not be field-verified, these wells pose a possible risk to subsurface aquifer contamination if not properly abandoned. Has this risk been addressed?

Page 2-17, Paragraph 4
Describe the term "channelized".

SECTION 3, FIELD INVESTIGATION PROGRAM

Page 3-5, Paragraph 3
This paragraph states that 3 rather than 5 resistivity survey lines were completed at Site 4 (Figure 3-3). The last sentence in this paragraph then states that "the locations of the survey lines were in the areas of suspected contamination, and upgradient and downgradient of the suspected contaminant zone, based on an assumed southeasterly ground water flow direction." Does this final sentence refer to the assumed ground water flow direction at Site 4? If so, then the survey lines are not consistent with assumed ground water flow at Site 4. Survey line E-1 would be upgradient and west of Site 4 while lines E-4 and E-5, which cross perpendicular to one another, are located downgradient from Site 4.

The pattern of locating the survey lines upgradient, in the suspected area of contamination, and downgradient, assuming a southeasterly ground water flow, is observed only for Site 2 (Figure 3-1).

Page 3-16, Section 3.2.4
No rationale is provided for the monitoring well locations. A regional ground water floor map based on previously-existing information would have been helpful. The RCRA Ground Water Monitoring Technical Enforcement Evidence Document, September, 1986, recommends that local hydrogeology be researched before intitiating a borehole program. RCRA guidelines recommend a minimum of 1 upgradient and 3 downgradient wells in the initial characterization of a site, or aminimum of 4 wells per site. Many of the sites had 3 wells installed. If only 3 wells are to be installed, locating the wells equidistant from each other and in the shape of an equilateral triangle is generally considered good practice in order to define the orientation of the pieziometric surface. In most instances this was not done (with the exception of site 4, figure 3-11), which invites an increased possibility for error in determining site specific ground water flow.

Additionally, the well locations do not appear to satisfy particular goals. That is, are the wells designed to collect upgradient water samples or downgradient water samples? Or to measure the degree of contamination within an affected area? The following are some examples:

Site 2, Figure 3-10
Well MW2-1 is located at the southwest edge of the softball diamond, MW2-2 and MW2-3 are located within the site boundary. If ground water flow is assumed southeast (we don't know at this point, see comment on page 3-5), then MW2-1 is upgradient and MW2-2 and MW2-3 are located within the contaminated area; no apparent downgradient monitoring well exists for this site.

Site 5, Figure 3-12
The monitoring wells installed in the vicinity of Site 5 are located a significant distance from the site boundary (see Figure 4-9). Are we looking for contamination within the site boundary? Or outside the boundary? The acute triangular shape of wells around the tanks also introduces the possibility of error when calculating the ground water flow direction. Furthermore, the location of these monitoring wells would not likely be intercept contaminated groundwater, because the groundwater flow appears to be toward the southwest.

Site 6, Figure 3-13
As above, an accurate definition of the site-specific pieziometric surface is difficult to assess due to their acute triangular configuration. Moreover, these

3 wells do not adequately surround the suspected area of contamination.

Page 3-27, Paragraph 1
This paragraph states that a minimum of 3 bore volumes of water was removed during initial well development. The convention according to EPA is a minimum of 5 bore volumes in initial well development and a minimum of 3 bore volumes prior to subsequent sampling events.

Reference

SECTION 4, RESULTS AND SIGNIFICANCE OF FINDINGS

Page 4-2, Federal and State Standards
The Site Drinking Water Act is referenced as being a federal environmental law which is "applicable or relevant and appropriate." However, the Maximum Contaminant Levels (MCLs) have been updated periodically. Are the MCL's included in this RI based on 1988 standard or 1992 standards? Table 4-2, page 4-4, for example lists the following as primary drinking water standards; silver 0.5 mg/kg; barium, 1.0 mg/kg; lead, 0.5 mg/kg; and endrin 0.2 mg/kg. The April, 1992, drinking water MCL's for these parameters is 0.1 mg/kg, 2.0 mg/kg, 0.015 mg/kg, and 2.0 mg/kg, respectively. (The lead level is actually an action level and not an MCL.) The RI's standards were based on the 1988 MCLs and should be updated to the 1992 MCLs. (This application of old MCL standard is a frequent occurrance for several parameters throughout the RI.)

Page 4-9 and 4-10, Table 4-6
As mentioned in the RA comments, monitoring well MW6-1 is not a valid "background" well based on Figure 4-34.

Page 4-11, Table 4-7
The average concentration for selenium in U.S. soils is 0.3 mg/kg based on Shields, 1985. However, the base's background selenium level is approximately 66.9 mg/kg. The average concentration for thallium in soils is 0.1 mg/kg, based on Bowen, 1966. However, the base's background thallium concentration is approximately 12.9 mg/kg. Although the above averages include a significant range of natural levels, are the base's "background" selenium and thallium concentrations truly natural?

Page 4-14, Paragraph 5
The coal ash is referenced on page 1-3 as being "of base stream generation." Is sampling and analysis of the ash

necessary to verify that the ash did not result from previous landfill burning?

The total fill depth within the landfill is discussed, but not resolved. Based on information within the RI, no soil borings were advanced through the landfill to determine its total depth. The maximum fill depths observed within the soil borings surrounding the landfill is approximately 10 feet bls. This issue must be resolved to adequately assess the possible impact to ground water (approximately 15 feet beneath the landfill surface, based on Figure 4-1). Moreover, a valid estimate of landfill volume including paint, pesticides, oils, transformers, drums, and hardfill, cannot be made unless the landfill's depth is known.

Page 4-14, Paragraph 6
An "upper sand layer" is distinguished from a deeper layer and described as being laterally "continuous over much of the landfill," except at well MW1-5. Such lateral continuity is not consistent beyond the landfill area, for example see cross-sections for Site 5 and Site 6. Additionally, page 2-14, paragraph 3, indicates that these sand "zones range in thickness from 1 to 12 feet and are almost totally enclosed in lower permeability silts and clays." Is the above-mentioned "upper sand layer" indeed laterally continuous, or is it a "zone" which is discontinuous? If the continuity is valid only beneath Site 1, is such an "upper sand layer" designation helpful or misleading.

(LIZ, WHAT DO YOU THINK??)

Pages 4-15, 4-16 and 4-17, Figures 4-1, 4-2 and 4-3
Geological cross-sections of transect A-A' and transect B-B' indicate that the banks of the Mosquito Creek are primarily made up of fill material from the landfill. Is this true?

The cross-sections also illustrate that the Mosquito Creek bed has an elevation of approximately 414.0' above mean seal level (msl) at A-A' and 411.5' msl at B-B'. These elevations indicate a surface water gradient of approximately 2.5' per 400' flowing toward the west. However, Figure 2-11 shows that the Mosquito Creek flows toward the east, across the landfill, not toward the west. Please explain these conflicting illustrations.

Figure 4-1 also indicates that the groundwater elevation within MW1-15 is 416.94' msl while the adjacent land surface elevation is 416.81' msl. Do these data indicate confined aquifer conditions? If so, what is the confining material? No place in this RI is the confining/unconfining issue

resolved. Is nearby well MW1-10 within the same confined aquifer?

Page 4-32, General Comments, including Figures 4-1 and 4-2
In general, the interpretation of sedimentary layers along transects A-A' and B-B' is difficult. No distinct unconformities or stratigraphic indicators exist within the drilling logs to definitively separate the Quaternary deposits into sedimentary units. The inferred lithologic boundaries depicted on the cross-sections appear to be literally continuous and relatively well-defined. However, soil descriptions included on the drilling logs, such as the log for monitoring well MW1-11, do not appear to indicate the existence of distinct lithologies. Perhaps, grain-size analysis for soil samples at 5-foot intervals would increase the confidence of such lithologic distinctions.

Page 4-161, Paragraph 2
The burn pit is described as having an "asphalt covering"; yet, paragraph 4 of page 1-6 describes the burn pit as being "concrete-lined". Which is correct? (See also the bottom line of page 4-161).

Page 4-174, Paragraph 2
This paragraph indicates that 10 mg/kg is the estimated TPH concentration for background soils at Site 4. If this TPH concentration is indeed background, then site-wide contamination of a volatile constituent may exist. Has the existence of such a high background concentration been explained?

Page 4-177, Source and Release
(In addition to RA comment...)
Apparently an underground storage tank exists in the vicinity of the burn pit to collect oil for reuse (page 1-6, paragraph 4). This UST is a possible source of subsurface soil and groundwater contamination. What is the integrity of this UST? How large is this UST? How old is this UST? Is this UST of steel or fiberglass construction?

Page 4-194, Paragraphs 1 and 3
Paragraph 1 suggests that high soil gas concentrations may be related to spillage during rail fuel deliveries. This paragraph further states that this previously existing railroad spur has been removed from the tank area. Paragraph 3 indicated that sampling and analysis is based on spillage from the above-ground tank. Why has the possible rail-related spillage not been further investigated? Typically large amounts of the herbicide, Atrazine, were

sprayed along railways to control plant growth. Has this source of site contamination been investigated?

SECTION 5, ALTERNATIVE REMEDIAL MEASURES

Page 5-1, Paragraph 1
The statement of work dated June 23, 1988, "The Installation Restoration Program Remedial Investigation/Feasibility Study (RI/FS)" Stage I for Scott AFB requires the development of preliminary alternative remedial actions, initial screening of alternatives and a detailed analysis of alternatives. Of the eight (8) sites, sites 2 and 7 were considered by this report to be adequately characterized and requiring no remedial action. However, since the exact location of site 2 was not determined (page 1-3), and the soil gas survey results did not correlate well with the analytical results for the soil (suggested to be from natural organics), further verification is suggested. However, since the last known use of the site was in 1852 exact definition is unlikely. Regarding site 7, due to the location of the monitoring well screens below the static water level, heating oil product, if present, would not likely be entering the wells (page 4-240, paragraph 2). Based on this, site 7 was not sufficiently characterized. Further verification is recommended.

Proceeding with remedial feasibility studies based on only one medium (ground water) due to a lack of information on the soil is not appropriate. Most effective remediation should consider the sites as a whole.

The extent of the soil contamination does not necessarily have to be known to provide preliminary remedial alternatives, when sufficient contaminant information is available. No detailed analysis of alternatives was conducted for any of the sites identified.

Page 5-1, Paragraph 3
As previously noted, proceeding with ground water remediation independent of the soil contamination is not appropriate.

Page 5-1, Paragraph 4
Long term management or remediation in the event of demolition/remodeling, etc. should be considered.

Page 5-2
Okay. Very general.

Page 5-5, Paragraph 3
Minor point, but there is no subsection heading or change in indentation to distinguish the treatment technologies. It is not clear if it is supposed to be under collection/disposal, page 5-4, or if there is a missing heading of collection/treatment/disposal.

Page 5-6, Paragraph 2
Freon should be avoided for use as a critical fluid where possible.

Page 5-9, Paragraph 1
As previously noted, the extent of contamination is not necessarily required to provide preliminary remedial alternatives and it was not sufficiently verified that 2 of the sites presented acceptable exposure risks.

Page 5-10, Paragraph 1
Biological treatment is not an appropriate remedial treatment method for the mercury contaminated soil at site 8, building 1680.

Page 5-11, Paragraph 2
Thermal destruction or incineration is not a method of choice for removal of mercury from soil.

Page 5-13
Screening of ground water remediation technologies should not be completed until it is determined if floating product does/does not exist since none of the well screens intersect the top of the water table, and as previously mentioned, consideration of the soil contamination and its impact on the remediation should be considered concurrently.

Page 5-15, Paragraph 4
Minor point, but the off gas controls for an air stripper would technically consist of "vapor" incineration not "fume" incineration.

Page 5-19, Paragraphs 1-3
The remedial alternatives do not address the soil contamination, as such they are incomplete.

Page 5-20, Paragraph 1
Same as above.

SECTION 6, RECOMMENDATIONS

Page 6-1, Paragraph 1
Since the well screens did not intersect the water table, additional characterization is recommended to determine if floating product exists at the sites.

For Site 8, it is not clear how the mercury contamination ended up below the building. It seems as though sampling was conducted below mercury storage areas. If spillage of sufficient quantities occurred to contaminate the soil below the building, then porous or semi-porous building materials would also be suspect. Building 1680 was reportedly renovated in 1987 which may have removed portions of the potentially contaminated building material (page 4-265). However, a sampling program to evaluate porous or semi-porous building materials should be considered.

APPENDICES

Appendix E, Drilling Log 1-8
A description of the monitoring well construction indicates that the well has a ten-foot screen finished at 30.20 feet below land surface (bls). However, the top of the sand pack is indicated at 25.10′ bls and the top of the bentonite seal is indicated at 22.10′ bls. If correct, bentonite and native soils surround the screen's top 4.9 feet. Is the data presented on the Drilling Log correct?

Appendix E, Drilling Log 4-2
The description for this monitoring well construction does not include information about the top of the sand pack and the top of the well screen. Such information should be included.

Appendix E, Drilling Log 7-2
The description for this monitoring well construction indicates that the top of the well screen is 20.50′ bls, and the bottom of the well screen is 29.81′ bls. These values indicate that the screen is 9.31 feet in length. However, the initial well data indicate a 10.00′ screen. Please clarify this apparent error.

ADDITIONAL COMMENTS FOR
TECHNICAL REVIEW OF
REMEDIAL INVESTIGATION
SCOTT AIR FORCE BASE
(1/19/93)

EXECUTIVE SUMMARY

SECTION 1, INTRODUCTION

SECTION 2, ENVIRONMENTAL SETTING

SECTION 3, FIELD INVESTIGATION PROGRAM

SECTION 4, RESULTS AND SIGNIFICANCE OF FINDINGS

Section 4, General Comments
Characterization of the groundwater for Scott A.F.B. has been inadequately determined in this RI. Foremost among the elements missing from this investigation is the determination of unconfined, semi-confined or confined aquifer conditions. The possibility of two hydraulically separate sand layers is discussed on pages 4-14 and 4-24, but determination of their continuity across the base, or even across any single site is also inadequately investigated. Groundwater flow directions are locally defined, but no effort has been made to characterize the groundwater flow regionally.

No summary table of the groundwater parameters for each of the sites has been made. Such a table would be useful for site-to-site comparisons. For example, groundwater velocities appear to be as low as 1 ft/yr at Site 6 while varying from 0 to 440 ft/yr at Site 1. In addition to providing tabled groundwater parameters, a regional shallow aquifer flow map should be made, if possible. If such a map is not realistic, such a statement-of-fact should be included in the RI.

Monitoring well screens appear to have been arbitrarily placed. Among the wells used to determine hydraulic conductivity values, the screened sediment ranges from coarse sand to sandy clay to silt. Is there, indeed, a laterally continuous shallow aquifer beneath Scott AFB? Or are the subsurface primarily glacial deposits laterally discontinuous? As suggested on page 2-14, paragraph 2 and 3, recharge of the sand and gravel zone is "almost totally enclosed in lower permeability silts and clays."

Section 4, Figures
The repositioning of the north arrow in many of the figures is confusing. WWES is not recommending that the figures be

redrafted, but WWES does recommend that the north arrow remain constant in future submittals.

Page 4-23, Paragraph 4
Variations in groundwater elevations and in particular, the reversal in flow directions for the southwest portion of the landfill area are attributed to 1) groundwater mounting, 2) increased precipitation, and 3) variation in the influent and effluent characteristics of Mosquito Creek. A fourth reason is likely primarily responsible for this variation. A waste water treatment plant was apparently being constructed during the November, 1988, and the December, 1988, sampling the vicinity of Site 3 (southwest of the landfill). Paragraph 2 of page 4-125 indicates that the depth of the excavation was approximately 23 feet bls, while the local depth to the water table was approximately 1 to 13 feet bls (see Figure 4-18). Continuous pumping of the excavation would, indeed, artifically lower the water table in the vicinity of the construction project. This artificial lowering of the water table limits the use of Site 3 monitoring wells as indicators of the groundwater's natural piezometric surface. Data from the wells should not be included on Figures 4-4 and 4-5 to indicate normal groundwater flow. Moreover, the duration of the construction project should be documented.

Page 4-23, Paragraph 5
What mathematical solution has been used to determine the hydraulic conductivity based on the slug and bail aquifer tests? Bouwer and Rice (1976)? Hvorslev (1951)? Cooper (1967)? Are we assuming that confined or unconfined conditions exist here? Why have the hydraulic conductivity values for two deep wells (MW1-1D and MW1-10D) not been included in this discussion? If not applicable to this portion or the RI, then why were these wells slug and bail tested?

Page 4-24, Paragraph 1

How are the flow rates (actually the velocities) calculated? What effective porosity values are used? (Porosity values of 30.0% to 38.8% were apparently used, based on back-calculations from the existing data.) Were the porosity values laboratory determined or taken from tables? Assuming ERM's highest calculated hydraulic conductivity of 2.46 x 10(-2) ft./min, the highest listed gradient of 0.08 ft./ft. and a reasonable silty sand porosity of 40% (Morris Johnson, 1967), a groundwater velocity of 7.1 ft./day appears to exist in the immediate vicinity of Mosquito Creek. Assuming a more gentle gradient of 0.002 ft/ft (see page 4-23, paragraph 3), a groundwater velocity of up to 0.2 ft/day appears to exist across the north and south cells of the landfill. The above range of 0 ft/day (assuming static water levels) to 7.1 ft./day vary from the values indicated

in the RI. Please include the calculations applied to this site's hydrogeological parameters in the RI appendices along with tabled results.

Page 4-103, paragraph 1
See the comment to page 4-23, paragraph 5

Page 4-125
If the November, 1988, and the December, 1988, groundwater data are suspect due to the wastewater treatment construction project, then why use hydraulic gradient data from this sampling period. The groundwater velocity does not appear to have been calculated based on the presumably more accurate June, 1989, and April, 1991, data. Why?

Page 4-125, paragraph 1
See the comment to page 4-23, paragraph 5

Page 4-161, paragraph 1
See the comment to page 4-23, paragraph 5

Page 4-189, Figure 4-29
The approximate site boundaries depicted on Figures 4-29 and 3-12 do not match. Both boundaries supposedly define the limits of Site 5, but Figure 4-29 only includes the bermed area of Tank 8550 while Figure 3-12 includes a much larger area. Which is the area of investigation?

Page 4-190, paragraph 2
See the comment to page 4-23, paragraph 5

Page 4-216, paragraph 2
See the comment to page 4-23, paragraph 5

Page 4-236, paragraph 1
See the comment to page 4-23, paragraph 5

SECTION 5, ALTERNATIVE REMEDIAL MEASURES

SECTION 6, RECOMMENDATIONS

Page 6-1, paragraph 6
This paragraph indicates that "potential contamination at (this site) was characterized". We disagree. Well screen elevations appear to have been arbitrarily placed. This makes it difficult to assess the validity of the groundwater data. None of the monitoring wells surrounding the landfill intercept the water table. (In fact, none of the 32 wells installed for this RI intercept the water table.) Consequently, successful characterization of light non-aqueous phase liquids (LNAPLs) has been jeopardized.

Page 6-6, Section 6.1.1.2

See the comments to page 6-1, paragraph 6.

Page 6-9, Section 6.1.1.3
See the comments to page 6-1, paragraph 6.

Page 6-9, Section 6.1.1.4
See the comments to page 6-1, paragraph 6.

Page 6-11, Section 6.1.1.5
See the comments to page 6-1, paragraph 6.

Page 6-13, Section 6.1.1.6
See the comments to page 6-1, paragraph 6.

APPENDICES

Appendix G

Apparently Appendix G includes the analytical results and the Quality Assurance review. Why was Appendix G not made available for this present technical review?